Remarks

Claims 1-8 are pending in the application. Claims 1-8 are rejected. Claims 9-16 are new. No new subject matter is added. All rejections are respectfully traversed.

Claims 1 and 8 are amended to make what is claimed more definite and particularly point out and distinctly claim the subject matter which applicant regards as the invention, and not to change the scope of what is claimed.

Claimed are subgroups of antennas. The amended claims make the *ordinary meaning* of the word "*subgroup*" clear.

"In mathematics, a group (or subgroup as claimed) is defined as a *single set of at least two elements*." The claimed elements are *L* subgroups of (at least two) antenna elements. Thus, the "at least two" limitation makes it perfectly clear that groups are intended.

Claims 1-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gore et al. (US 2002/0102950 A1, hereinafter Gore) in view of Tujkovic et al. (US 6,934,320 B2, hereinafter Tujkovic).

First, Applicants note that Gore issued as U.S. Patent 6,917,820 in 2005.

Second, Gore is only concerned with antenna selection to reduce interference and the complexity of his hardware where the number of RF

chains is always less than the number of antennas. Tujkovic does not describe antenna selection, only interference reduction.

Gore does not describe his space-time diversity processing (STDP) 304. The entire description of the STDP consists of: "[0019] The transmitter 30 consists of a space-time processing unit 304 that converts the data to be transmitted into signals to be transmitted from each of the antennas 302." The STDP in Gore takes place *before* antenna selection, See block 3 Figure 1. Gore does provide any insight how the STDP works. Thus, any comments by the Examiner regarding the Gore STDP can only be a conjecture.

In contrast, the invention is concerned with *maximizing the data rate* to improve performance after antenna selection using adaptive modulation and coding (AMC) a novel space-time transmit diversity (STTD) encoding *after* antenna selection, see Figure 4, and claim 1 as originally submitted and currently amended.

Claimed is selecting, according to channel conditions of the multiple-input / multiple-output wireless communications system, L subgroups of the M subgroups of antennas, where $L < M$ and each of the L subgroups of antennas includes a set of at least two antennas. That is, the number of selected antennas is at least $2L$.

In Gore there is one input data stream to the space-time diversity processing, and there is exactly a one-to-one correspondence between the number of

output data streams from the STDP, the number of RF chains, and the number of selected antennas see block 30 Figure 1.

Consequently, Gore cannot perform the demultiplexing, coding, encoding and transmitting steps as claimed.

The Examiner states:

Gore discloses demultiplexing the input stream into L substreams, there being one substream for each of the L selected subgroups of antenna (paragraph 20, where Gore discusses k RF chains and k transmit antennas).

With all due respect, this is incorrect. What Gore describes is: "[0020] The transmitter 30 includes a plurality of RF chains 301-1 through 301-**k** which can be selectively coupled to a plurality of antennas 302-1 through 302-n by a switch 303. The switch 303 can connect **k** RF chains 301 to any set of **k** transmit antennas."

First, there is no description of any type of demultiplexer in paragraph [020]. Second, even more damaging, if the **k** number of RF antennas is exactly the same as the number of **k** transmit antennas, then demultiplexing is impossible

Claimed is adaptively modulating and coding each of the *L* substreams to a maximum data rate while achieving a predetermined performance on an

associated channel used to transmit the substream. The Examiner stipules that Gore does not perform this step.

Claimed is space-time transmit diversity encoding each of the L coded substreams into a set of at least two output streams, there being one output stream for each antenna in the set of at least two antennas of each one of the L subgroups of antennas. As stated above, it is impossible for Gore to perform this step.

Claimed is transmitting the set of at least two output streams using the L subgroups of at least two antennas. Again, Gore cannot perform this step.

In summary, Gore does not describe or perform any of the claimed steps.

The Examiner stipules that Gore does not perform this step.

Tujkovic cannot cure any of the numerous fatal defects of Gore, including the claimed adaptive coding.

As stated above, claimed is *adaptively* modulating and coding each of the L substreams to a *maximum data* rate while *achieving a predetermined performance* on an associated channel used to transmit the substream. There are at least three elements here, adaptive encoding, maximum data rate, and predetermined performance.

As stated in the specification: "[0022] In order to *adaptively* allocate different data rates for each substream 111, it is *necessary for the receiver to perform channel or SNR estimations* for the received signal from each transmit antenna, and *report this back to the transmitter as the channel condition* 160."

Nowhere does Tujkovic describe receiving feedback channel SNR from a receiver in order to perform adaptive coding. Tujkovic is completely silent on maximum data rates, or data rates of any kind.

Similarly, the only discussion of performance in Tujkovic is with respect to FER, see Figures 6-10. The claimed performance relates to maximum data rate to reach a maximum system capacity, not some reduction in error rate as in Tujkovic.

Thus, Gore in combination with Tujkovic do not perform any of the steps in claim 1, and cannot make what is claimed obvious.

Furthermore, Gore and Tujkovic are incompatible with each other and cannot be combined. IN fact, Tujkovic teaches away form Gore. Gore encodes before sending data to the RF chains, and places his switch after the RF chains and the switch is directly connected to the antennas. Tujkovic does require a switch, and connecting the Gore switch between his RF chains 20 and antennas 22 makes not sense.

With respect to claim 8, see above.

With respect to claim 2, claimed is selecting a data rate according to the channel conditions. This is not described by Gore.

With respect to claim 3, it is not at all obvious that the channel conditions can be used to select the data rate.

With respect to claim 4, what is claimed is adaptive modulation and coding thet depends on the number L of the substreams.

The Examiner states:

Regarding claim 4, Gore further discloses transmitting k RF chains (paragraph 20).

Applicants, as would any one of ardinary skill in the art, what fail to see any connection between the Gore **k** transmit stream, and the claimed adaptive modulation and coding. RF chains do not code.

Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gore in view of Tujkovic as applied to claim 1 above, and further in view of Kim (US 2003/0103474 A1).

With respect to claim 5, claimed is the number of subgroups L is zero to increase an overall capacity of the system including a plurality of receivers.

As stated above, Gore in view of Tujkovic teach none of the limitations of claim 1.

The Examiner states:

> Kim discloses interference is proportional to number of antennas (paragraph 28). Therefore, reducing number of antenna or channel will reduce interference and increase efficiency. It would have been obvious to one having ordinary skill in the art at the time of the invention to modify the method for transmission disclosed by Gore and Tujkovic to reduce the number of channels disclosed by Kim such that interference can be reduced and hence system efficiency can be increased.

First, Kim is non-analogous art. 6. Kim only deals with repeaters. Kim is not a MIMO system The Kim transceivers only have a single antenna, there is no antenna selection of any kind. Kim cannot be combined with Gore andTulkovic.

Paragraph [028] in Kim states: "These repeaters, however, have a problem of increasing reception interference of the reverse link in proportion to the number of the antennas."

What Kim describes has nothing to do with what is claimed, the number of subgroups L is zero to increase an overall capacity of the system.

Firsty, there are no subgroupds of antennas in Kim. including a plurality of receivers. Second, reducing the number of antennas to reduce interference does not increase channel capacity. Anyone of ordinary skill in the art would readily understand, that fewer antennas can only decreases system capacity. As stated in the specification, capacity is increased by transmit diversity as claimed. As stated in the specification, "the system capacity is improved as the dimension of the diversity, i.e., number of the antennas, increases." This is in direct contradiction

with the Examiner's interpretation of Kim, erroneously linking an increase in channel capacity with a decrease in the number of antennas.

Claims 6 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gore in view of Tujkovic as applied to claim 1 above, and further in view of Walton et al. (US 2003/0235147 A1, hereinafter Walton).

With respect to claims 6 and 7, claimed is adaptive modulating and coding, further comprising coding each substream, interleaving each coded substream, and symbol mapping each interleaved substream; and demultiplexing each output stream into a plurality demultiplexed output streams, multiplying each of the plurality of demultiplexed output streams by an orthogonal variable spreading factor, adding the demultiplexed output streams, for each ouput stream, after multiplication into a summed output stream corresponding to each output stream, and multiplying each summed output stream by a scrambling code.

First, Walton issued as U.S. Patent 7,095,709 in 2006.

Second, it is noted that none of the limitations are disclosed by Gore in view of Tujkovic.

Third, Tujkovic cannot code substreams as claimed.

Fourth, the invetnion is not concerned with imroving reliability, but with increasing system capacity, see above.

Fifth, the spreading factos in Walton are different, and not the same as claimed: "[0088] time spreading these symbols with a *different* orthogonal function for each transmit antenna, as described below."

It is believed that this application is now in condition for allowance. A notice to this effect is respectfully requested. Should further questions arise concerning this application, the Examiner is invited to call Applicants' attorney at the number listed below. Please charge any shortage in fees due in connection with the filing of this paper to Deposit Account 50-0749.

Respectfully submitted,
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